OBJECTIVE 26: INGESTION EXPOSURE PATHWAY - DOSE PROJECTION AND PROTECTIVE ACTION DECISION MAKING

OBJECTIVE

Demonstrate the capability to project dose to the public for the ingestion pathway and to recommend protective measures.

INTENT

This objective is derived from NUREG-0654 which provides that OROs should have the capability to calculate projected dose via the ingestion exposure pathway, relate projected dose to protective action guides, decide whether to put animals on stored feed, and choose other appropriate protective actions for the ingestion pathway emergency planning zone (EPZ). (See evaluation criteria from Planning Standard I., J., and N.)

Guidance for the ingestion pathway is provided in FEMA Guidance Memorandum (GM) IN-1, The Ingestion Exposure Pathway, dated February 26, 1988. Guidance contained in this GM is incorporated by reference in this Manual. Guidance is also provided for the ingestion exposure pathway in the FEMA documents FEMA REP-12, Guidance on Offsite Radiation Measurement Systems: Phase 2, The Milk Pathway and FEMA REP-13, Guidance on Offsite Emergency Radiation Measurement Systems: Phase 3 - Water and Non-Dairy Food Pathway.

In the event of an accident at a commercial nuclear power plant, a release of radioactive material may contaminate water supplies and agricultural products. Contamination may occur during the emergency phase of the accident and, because of the long half-life of certain radioisotopes, remain in the food chain for weeks to years, depending on the isotopes involved.

This objective supports Objective 27, Ingestion Exposure Pathway - Protective Action Implementation, which focuses on implementation of protective actions for the ingestion pathway EPZ. Its accomplishment is dependent upon decisions made under this objective and based upon results from Objective 25, Laboratory Operations, which provides results of the laboratory analyses of field samples, obtained under Objective 24, Post-Emergency Sampling.

DEMONSTRATION CRITERIA

NUREG	CRITERION
I.8., J.10.,11.	**1. Projected dose is calculated for the ingestion exposure pathway.**

Explanation

The dose assessment group should demonstrate the capability to make recommendations on precautionary protective actions within the ingestion pathway EPZ to prevent contamination of food and drinking water. The ingestion pathway EPZ is an area within an approximate 50 mile radius centered at the nuclear power plant. These early recommendations, which are made prior to the receipt of laboratory data on field samples, should be based on information regarding potential or simulated releases and wind direction data or forecasts. Examples of precautionary actions that may be appropriate at the time are: place dairy cattle on stored feed, protect drinking water supplies for animals, and cover animal feed supplies that are stored outside.

Calculations of projected dose for the ingestion exposure pathway should be carried out following the receipt of results of laboratory measurements of radioactivity levels in food or water samples. Recommendations on the need for protective actions can be made by comparing the results of these calculations to the protective action guides (PAGs). Calculations of projected dose require data on relative concentrations of radionuclides in specific foods and water, half-lives, and the rate of intake of each food. Since ingested radioactive material may remain in the body for days to years, the dose is calculated for the entire period of internal exposure (up to 50 years), not just the period when the food is consumed. This long term dose is referred to as committed dose. For situations where derived response levels (see next paragraph) are not available, the dose assessment group should demonstrate the capability to convert laboratory data into projected dose for the ingestion pathway. These dose projections should be in appropriate units for comparison with established PAGs.

Extent of Play

Under this criterion, all activities should be completed as they would be in an actual emergency.

The dose assessment group should develop protective action recommendations (PARs) using two sets of data provided by exercise controllers. The first set consists of accident data based on projections of radioisotope release. The second set consists of assessment data based on radiation levels found in field samples of local agricultural products and

drinking water. Since these data will not be generated by laboratory measurements, they should be provided to the dose assessment group by controllers. All data should be in the form normally available either from the licensee, field monitoring teams, or the laboratory. Also, data should be transmitted over communication channels that would be used in an actual radiological emergency. Data should reflect the uncertainties normally present in actual data measurements. Thus, only data that could actually be collected within the scenario time frame should be made available. Producing such scenario data can be very time consuming and the process is prone to error. The data should be produced as part of the scenario and cross checked for error, applicability, and consistency with the simulated release scenario.

NUREG	CRITERION
J.11.	**2. Protective action decisions are made for the ingestion exposure pathway.**

Explanation

OROs should demonstrate the availability and use of up-to-date maps and listings of all agricultural producers and distributors, harvesting schedules, and exposed drinking water sources within the ingestion pathway EPZ in order to identify the types of protective actions appropriate to areas where dose to the public exceeds applicable PAGs.

OROs should demonstrate the capability to make decisions concerning protective actions designed to prevent or reduce contamination of food and drink. OROs should also demonstrate the capability to make decisions concerning protective actions to isolate contaminated food, milk products, or drinking water to keep them out of commerce. Except for early precautionary protective actions taken with dairy cattle, all protective action decisions should be based on verified, measured field samples of food, milk products, and drinking water. The projected dose or measured levels of contamination should be compared to the PAGs or to derived response levels as appropriate.

Responsible OROs should demonstrate the capability to accomplish joint decision making between two or more OROs, if called for in emergency plans and procedures. If plans do not call for joint decision making, OROs should demonstrate the capability to promptly notify other OROs when protective action decisions are made. They should demonstrate the capability to discuss issues that may be raised by the other OROs regarding PARs and their implementation for the ingestion pathway.

Extent of Play

Under this criterion, all activities should be completed as they would be in an actual

emergency.

NUREG	CRITERION
N.1.a.	**3. All activities described in the demonstration criteria for this objective are carried out in accordance with the plan, unless deviations are provided for in the extent-of-play agreement.**

Explanation

Responsible OROs should demonstrate the capability to follow policies, implement procedures, and utilize equipment and facilities contained in their plans and procedures. OROs should demonstrate that they can follow sequences outlined in the various procedures and perform specified activities, as necessary.

Extent of Play

Under this criterion, all activities should be carried out as specified in the plan, unless deviation from the plan is provided for in the extent-of-play agreement.

CLARIFICATION OF TERMS

The following definitions describe the limited meaning of terms in the context of the Exercise Evaluation Methodology and may vary from the full technical definition for all circumstances.

Committed dose refers to the dose that will be received over a period of 50 years from the ingestion or inhalation of a particular quantity of a radionuclide or a specific mix of radionuclides.

Committed effective dose equivalent refers to the sum of the 50-year committed doses to individual organs from inhalation (or ingestion) of radionuclides, where the individual organ doses have been adjusted so that the associated risk of fatal cancer can be added to the risk of fatal cancer from whole-body dose.

Derived response level is a calculated concentration of a particular radionuclide in a particular medium (e.g., food) that will produce a dose equal to a protective action guide.

Emergency phase refers to the initial phase of response actions, during which actions are taken in response to a threat of release or a release in progress.

Isotope refers to one of two or more atoms of an element which have the same number of protons in the nucleus but a different number of neutrons. Some isotopes of a particular element may be radioactive while the others are not.

Projected dose is the estimated or calculated amount of radiation dose to an individual from exposure to the plume and/or deposited materials, over a period of time, in the absence of protective action.

Protective action guides (PAG) refers to projected dose to an individual in the general population that warrants the implementation of protective action. Specific PAG's have been recommended in terms of the level of projected dose that warrants the implementation of evacuation/sheltering, relocation, and limiting the use of contaminated food, water, or animal feed.

Radionuclide refers to a radioactive isotope of a particular element.

Relocation refers to a protective action, taken in the post-emergency phase, through which individuals not evacuated during the emergency phase are asked to vacate a contaminated area to avoid chronic radiation exposure from deposited radioactive material.